base plate 51. A plurality of head arms 54 are formed to extend in the direction parallel to the recording surface of the magnetic disk 10 at one end of the actuator 53. A spring arm is installed on one end of a head arm. The slider 40 is installed with an intervening insulation film, which is not shown, to the flexure part of the spring arm 55. A coil 57 is installed on the other end of the actuator 53.

[0043] The magnetic circuit 58 formed by a permanent magnet and a yoke is provided on the base plate 51; the top of the base plate 51 is covered by a cover 59. A voice coil motor (VCM) is constructed by a magnetic circuit 58 and a coil 57; the coil 57 is disposed in the magnetic gap of the magnetic circuit 58.

[0044] The operation of the magnetic disk apparatus described above is explained next. When the magnetic disk 10 stops, the slider 40 comes into contact with a parking zone of the magnetic disk 10 and stops. Next, when the magnetic disk 10 is rotated by the spindle motor 52, the slider 40 is floated at a small gap from the disk surface by the air flow produced by the rotation of the magnetic disk 10. If current flows in the coil 57 in the state with the slider floating, a propulsive force towards the coil 57 is generated, and the actuator 53 rotates. Then the slider 40 moves above the specified track of the magnetic disk 10 and reads or writes data.

[0045] Track edge noise is effectively suppressed because the guard bands of the magnetic disk 10 cannot be written in this magnetic disk apparatus. Furthermore, preventing writing to the guard bands is realized without using grooves, and the surface of the magnetic disk 10 is nearly flat. Therefore, the air flow on the magnetic disk surface produced by the rotation of the magnetic disk 10 is well regulated and can maintain stable floating of the slider 40.

[0046] The magnetic recording medium of one embodiment of the present invention has a recording layer with a multilayered ferromagnetic structure, and has regions in which the ferromagnetic layers are ferromagnetically coupled to each other and regions in which they are anti-ferromagnetically coupled. By allocating the regions of ferromagnetic coupling as the recording tracks, the recording tracks are magnetically separated and track edge noise is decreased. Thus, the intervals between the tracks can be narrowed and the track density can be increased. In addition, a magnetic recording medium embodying the present invention has a high degree of surface smoothness and stable floating of the head because grooves are not formed in the substrate. As a result, the amount of flotation of the head can be reduced, and the line density can be increased.

[0047] Consequently, noise reduction and higher densities for both the track density and the line density become possible using embodiments of the present invention. Thus, a more compact and higher capacity magnetic recording medium can be designed.

Claims

1. A magnetic recording medium comprising:

   a first ferromagnetic layer;
   a non-magnetic layer; and
   a second ferromagnetic layer successively deposited as a recording layer on a non-magnetic substrate; wherein the recording layer includes:

   recording areas in which said first and second ferromagnetic layers are ferromagnetically coupled, and
   non-recording areas in which said first and second ferromagnetic layers are anti-ferromagnetically coupled,
   said non-recording areas being located between said recording areas.

2. A magnetic recording medium according to Claim 1, wherein said recording areas and said non-recording areas are provided alternately in the radial direction in concentric circles.

3. A magnetic recording medium according to Claim 1 or 2, wherein said first ferromagnetic layer has thicker film thickness than said second ferromagnetic layer.

4. A magnetic recording medium in which a recording layer is deposited on a non-magnetic substrate, the recording layer comprising:

   at least one recording area composed of a ferromagnetic material; and
   at least one non-recording area composed of:
   deposited layers of a first ferromagnetic layer;
   a non-magnetic layer; and
   a second ferromagnetic layer.

5. A magnetic recording medium according to Claim 4, wherein said recording areas and said non-recording areas are provided alternately in the radial direction in concentric circles.

6. A magnetic recording medium according to Claim 4 or 5, wherein said first ferromagnetic layer has thicker film thickness than said second ferromagnetic layer.

7. A method for manufacturing a magnetic recording medium comprising:

   successively depositing a first ferromagnetic layer, a non-magnetic layer, and a second ferromagnetic layer as a recording layer on a non-magnetic substrate; and

locally heating portions of said recording layer to produce spaced ferromagnetic regions in the recording layer.

8. A magnetic disk apparatus including a magnetic recording medium as claimed in any one of claims 1 to 6.